GROUPDLA

Building Code of Australia 2016

Report for BCA Compliance

PROJECT NAME: Sydney Opera House – Renewal Project – Concert Hall – for DA Submission

DATE: 7 September 2018

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Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	8.11.2015	High Level Concept Review (50%)	Author – Shane Berry /Specialist Regs Consultant Approved - Brett Clabburn / Director	
B	17.12.2015	High Level Concept Review (100%)	Author – Shane Berry /Specialist Regs Consultant Approved - Brett Clabburn / Director	
C	3.06.2016	High Level Schematic Review (for the 100% SD)	Author – Shane Berry /Specialist Regs Consultant Approved - Brett Clabburn / Director	
D	10.11.2016	High Level DA Review (50% DA Design)	Author – Shane Berry /Specialist Regs Consultant Approved - Brett Clabburn / Director	
E	17.02.2017	Review of 100% DD	Author – Shane Berry /Specialist Regs Consultant Approved - Brett Clabburn / Director	
F	18.05.2017	50% Preliminary Issue for Tender	Author – Shane Berry /Specialist Regs Consultant Approved - Brett Clabburn / Director	
G	16.10.2017	Issued for DA Submission	Author – Shane Berry /Specialist Regs Consultant Approved - Brett Clabburn / Director	
H	7.09.2018	Issued for DA Submission	Author – Shane Berry /Specialist Regs Consultant Approved - Brett Clabburn / Director	

Table 1 – Revision History

1.0 Executive Summary

The report is for the assessment of the Concert Hall portion of the Sydney Opera House Renewal Project to assess compliance with the Building Code of Australia 2016 Amendment 1("BCA").

The following items have been noted as items of interest at this stage of the review. The items have been considered non-compliant require further review against the detailed design, or may be able to be justified as a Performance Solution. **From a BCA certification point of view, the plans are suitable for DA submission. The resolution of the non-compliant items are WIP and will comply with BCA prior to the issuance of the relevant Crown Building Works Certificate.**

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
1A	Tech Zone and associated plant rooms to Level 8 & Level 9 proposed additions will not contain the required fire rated floor, nor are the existing supporting members fire rated such as: • Existing supporting trusses and Portal Frame. • Frame supporting winch pulleys. • Existing Bio Box and Bio Box trusses. • All new structure supported by existing structure. Level 6 Port Galleries have been illustrated with new floor area also. Further plan detail is required to assess whether the BCA requires this area to be fire rate, i.e. enclosed by walls? Significant equipment? Etc.	Fire Safety Engineer has confirmed the feasibility of a Performance Solution, refer Section 6.1 of Draft Fire Engineered Report for 100% Tender Documentation 243928-06 Rev A dated 22.11.2017 This section of the FER may need to be updated to include Level 6 Port Galleries.	C1.1	CP1, CP2
2	The egress review has noted the following items: a) Exits to be identified/clarified. b) Closed out. c) Reduced width to the eastern side foyer steps due to the introduction of the Level 2 Tunnel. d) Closed out. e) Closed out. f) Closed out	Item a – Exit plan to be finalised between Arup, GDLA & ARM:, FRL plans to nominate exits, then GDLA & Fire Safety Engineer to review and comment. Item c - Fire Safety Engineer has confirmed the feasibility of a Performance Solution, refer Section 6.3 of Draft Fire Engineered Report for 100% Tender Documentation	D1.3 D1.6	EP2.2, DP5 DP6

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
2 Cont.	g) Further assessment required in a number of areas, see Part D1 below for specific details and specifically listed areas of concern. h) Levels 7a, 8 & 9 - The use of new ladders for egress in lieu of fire isolated stairs. Level 9 (2 x Ladders to L8), to Level 8 (2 x existing stairs, 1 x new spiral stair) to Level 7A (1 x spiral stair) in lieu if fire isolated exits. Non-compliant discharge of exits, i.e. to intermediate storeys rather than direct to openspace, i.e. new spiral stair discharge to L7, Ladders to L8, Appears no egress of L9.04, etc. The introduction of a fold down ladder is currently under review.	243928-06 Rev A dated 22.11.2017 Items g & h - ARM to advise further, then Fire Safety Engineer to review and comment. Fire Safety Engineer has included a Performance Solution, refer Section 6.5 of Draft Fire Engineered Report for 100% Tender Documentation 243928-06 Rev A dated 22.11.2017. However this solution needs to be finalised and sets out the parameters for the design team to consider/meet. t	Part D D1.3, D1.7	- DP5, EP2.2
3	Proposed handrail systems require further design consideration which is currently under review with the following issues noted to date: • The use of a dome button at the top and bottom of each handrail in lieu of providing the handrail turndowns and TGSI. • Handrail diameters to be 55 mm in lieu of not more than 50 mm. • Handrail heights to exceed 1 m.	A justifiable Performance Solution from the Access Consultant may be required.	D2.17, D3.1, D3.3	DP2
4	Closed Out.	-	-	-
5	Closed Out.	-	-	-
6	Relocated to Item M of Table 3 below.	-	-	-

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
7	Smoke exhaust system. BCA reduced system to be provided, i.e. reduced make-up air supply.	Fire Safety Engineer has confirmed the feasibility of a Performance Solution, refer Section 6.3 of Draft Fire Engineered Report for 100% Tender Documentation 243928-06 Rev A dated 22.11.2017	NSW Table E2.2b. NSW H101.22	EP2.2
8	Relocated to Item L of Table 3 below.	-	-	-
9	Closed Out.	-	-	-
10	It is understood that the new mechanical exhaust plant on the upper Levels will not be fire separated from the remainder of the building.	Fire Safety Engineer has confirmed the feasibility of a Performance Solution, refer Section 6.1 of Draft Fire Engineered Report for 100% Tender Documentation 243928-06 Rev A dated 22.11.2017. However, the FER needs to be updated to considered C2.12 and justify CP7.	C2.12	CP7
11	Closed Out.	-	-	-
12	Northern Foyer Lifts 29 & 30 connect 3 storeys without the required fire isolated shaft protection. Lift motor room not fire separated from the remainder of the building.	Fire Safety Engineer has confirmed the feasibility of a Performance Solution, refer Section 6.2 of Draft Fire Engineered Report for 100% Tender Documentation 243928-06 Rev A dated 22.11.2017	C1.1, C2.12, C2.10, C3.10	CP2
13	The plans illustrate a grouping or wheelchair seating spaces in excess of 5 spaces to the Stalls areas.	A justifiable Performance Solution is required from the Access Consultant in support.	D3.9	DP1
14	Orchestra Platform refurbishment is to include automated Forestage Lift. This appears to be a technical non-compliance with the BCA?	Vertical Transport Engineer and Access Consultant to confirm compliance or otherwise.	E3.6	DP1, EP3.4

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
15	Deleted	-	-	-
16	Inadequate fire hose reel coverage. Areas cut off by the fire proposed compartmentation Design, i.e. L2,ST.01, L1.ST.01, etc, etc,TBC.	1. Proposed architectural fire compartmentation plans to be completed. 2. Fire Services Engineer to review and nominate any new shortfalls. 3. Fire Safety Engineer to then comment on the feasibility of justification via Performance Solutions.	E1.4	EP1.1
17	The proposed Level 2 tunnels will have a low ceiling height of less than 2700 mm, actual 2000 mm as confirmed by the architect. The Fire Services Engineer is to consider the location of the sprinkler heads and advise whether or not this will decrease the head height further. Further review/design input required.	The Ergonomics Consultant the feasibility of a justifiable justification Performance Solutions, refer David Caple & Associates Report dated 16 February 2018.	F3.1	FP3.1
18	Closed Out.	-	-	-
19	Deleted.	-	-	-
20	Deleted	-	-	-
21	Removed from scope	-	-	-
22	Acoustic Reflectors - sprinkler coverage obstruction. If they reflectors are to be automated to change to a vertical position upon fire trip, then this will need to be considered/justified as a fire engineered Performance Solution.	Fire Safety Engineer has confirmed the feasibility of a Performance Solution.	E1.5	EP1.4

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
23	Level 1 - New threshold ramps at internal doorways and corridors not permitted: • Male and Female WC corridor. • AWC. • STORE (west). • LOCKER ROOM. • Other areas on L1. Must only be position at doorways which open to a road or open space.	Seek comment on the feasibility of a Performance Solution from the Access Consultant. It is unclear on whether or not this issue has been rectified on the latest plans, architect to confirm. The plans do no illustrate enough FFL's.	D2.15	DP2
24	Closed out.	-	-	-
25	Lift 29 & 30 - Sprinkler protection to lift shaft top ~~and bottom~~ not to be provided.	Fire Safety Engineer has confirmed the feasibility of a Performance Solution, refer Section 6.2 of Draft Fire Engineered Report for 100% Tender Documentation 243928-06 Rev A dated 22.11.2017. However, the sprinkler system provided will be a wet system with an isolation valve, in which the Fire Services Engineer has confirmed as a non-compliance. This also needs to be addressed with the Performance Solution or confirmed a redundant issue.	E1.5	EP1.4
26	Lift 29 & 30 – Inadequate level of BCA DTS fire rating to supporting members.	Fire Safety Engineer has confirmed the feasibility of a Performance Solution. This issue does not appear to have been included in FER Performance Solution 6.2.	C1.1	CP1

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
27	Level 3 Male and Female new stair widths appear less than 1 m. Appears 5 or 6 mm over 1 m, however Actual TBC by the Architect. Latest plans appear to illustrate a further increased column width in these areas.	Fire Safety Engineer to review and comment on the feasibility of a Performance Solution.	D1.6	DP6
28	No Stretcher facilities provided in the lifts.	Vertical Transport Engineer to provide a justifiable Performance Solution.	E3.2	EP3.2
29	No required ambulant WC illustrated to the new Male Performer Amenities L1.AM.02.	Design Change Required.	F2.4	
30	Level 1 eRamps x 2 appear to be an issue with Premises Standards affected part upgrade compliance as they are illustrated as 1:11 & 1:12 (steeper than 1:14).	DDA Consultant to review and comment.	D3.1 – Premises Standards	DP1, DP2
31	Level 2 new accessible theatre ramps at the new doorways to the theatre are non-compliant at stepper than 1:40, proposed 1:11.	DDA Consultant to review and comment.	D3.1	DP1, DP2
32	A number of proposed/altered stairs do not illustrate the required handrails to both sides, rather single handrails, i.e. ~~L3 WC entries,~~ etc. See Outstanding Item S1 below also.	Access consultant to review in conjunction with the architect and confirm compliance. Architect to illustrate unobstructed width between handrails, note that any widths less than 1 m will need to be referred to the Fire Safety Engineer for assessment of feasibility of a justifiable Performance Solution.	D3.3	DP2
33	Closed out.	-	-	-

Item No.	Query or DTS Non- Compliance	Suggested Resolution	BCA Clause	BCA Performance Requirements
34	Level 2 Tunnel – Shortfall in sprinkler coverage and omission of fire separation from sprinkled to non-sprinkled areas.	Fire Safety Engineer has confirmed the feasibility of a Performance Solution, refer Section 6.6 of Draft Fire Engineered Report for 100% Tender Documentation 243928-06 Rev A dated 22.11.2017	EP1.5	EP1.4
35	Concert Hall theatre - SISSEP (EWIS) sounders will not achieve speech intelligibility and strobes will be provided in support.	Fire Safety Engineer has confirmed the feasibility of a Performance Solution, refer Section 6.7 of Draft Fire Engineered Report for 100% Tender Documentation 243928-06 Rev A dated 22.11.2017. However, the Performance Solution needs to be updated to recognise and justify E4.9 & EP4.3.	E4.9	EP4.3
36	New Store L1.ST.01 is required to be fire separated from the remainder of the building, inclusive of upgrading of the existing walls/floor/ceiling if they do not achieve the required 60 minute FRL.	Design change to achieve compliance.	NSW H101.16	CP2

Table 2 – DtS Non-compliances

In order for Group DLA to confirm the design complies with the BCA the following items listed in Table 3 below are required to be clarified, submitted, illustrated, etc. as the case may be:

Item No.	Item	Comment	BCA Clause
A	Further clarification in relation to the selected "Principal Pedestrian Entrance" and a Premises Standards review in general.	Further comment from the access consultant is pending sought. Confirmation of compliance with regard to the upgrade requirements of the *affected part* of the project will also be required from the Access Consultant. The access Consultant will need to confirm whether or not any of the existing lifts will required an upgrade as a result of the *affected part* related provisions of the Premises Standard.	Premises Standard
B	Closed Out.	-	-
C	Detailed egress review.	Paths of Travel - All paths of travel are required to be dimensioned for further assessment. There appears to be issues with regard to the replace and/or refurbished stairs containing paths of ravel which may be less than 1 m (or more if required by the Fire Safety Engineer.) Note that handrails are required to both sides of the stairs. Foyer Area Reduction – Level 2 air locks cause a reduction in foyer discharge area, further assessment required to determine if compliance has been achieved: a) Architect to confirm current and proposed southern foyer floor area. b) Closed out. c) Group DLA to confirm compliance or otherwise. If a non-compliance exists, Fire Safety Engineer to confirm feasibility of a Performance Solution. Level 7a, 8 & 9 paths or travel to the exits to be illustrated for further assessment, inclusive of the resulting path unobstructed widths/heights. This is currently WIP. See Part D1 below for specific details and specifically listed areas of concern.	Part D1 & D2

Item No.	Item	Comment	BCA Clause
D	Closed Out.	-	-
E	FRL Plans.	Color coded fire rating plans have been developed by Arup, dated 22 September 2016. These are now required to be superimposed onto the proposed architectural plans for further assessment. There may be issued with the current wall types illustrated, TBC following a review of the updated plans. The fire compartment plans illustrate an increase in the Foyers due to the tunnel inclusion, and an increase in Theatre size due to the new entries on Level 2. We require the existing and proposed floor area and volumes to this area in order to determine whether or not a non-compliance exists. FRL plans are required to illustrate the BCA required exits from each storey. It is expected that this will be completed by Group DLA and the Fire Safety Engineer in the first instance, following receipt of the FRL plans.	Various
F	Structural Engineers confirmation of the pending FRL plans.	Once the FRL plans have been completed the Structural Engineer will need to review and confirm compliance or otherwise. There may or may not be issues with regard to in adequate existing fire ratings.	Part C
G	Closed Out.	-	-
H	Performance Solutions – General	The various design team members are requested to advise of any/all known Performance Solutions at this stage of the design.	BCA
I	Relocated to Item 7 of Table 32 above.	-	-

Item No.	Item	Comment	BCA Clause
J	Fire Fighting Systems – Wet and Dry	Further review of the existing firefighting systems is required. Specifically, provide a report form a qualified fire services engineer which details the type performance of the existing firefighting systems, and nominates any foreseen shortfalls in the existing, and proposed design.	Part E
K	Stalls, Choir & Platform Box Seating.	Further review of the proposed floor and detailed seating layout for the front row design is required, as these are considered new works compliance with BCA 2016 will be required.	NSW H101
L	Lift 29 & 30 Non – compliances.	The following potential non-compliances are required to be confirmed compliant or otherwise: • Adequate level of fire rating to support members achieved? Structural Engineer. Performance Solution has been provided by the Fire Safety Engineer, Closed out. • Sprinkler protection to lift shaft top and bottom to be provided. Performance Solution has been provided by the Fire Safety Engineer for the omission of the top sprinkler. Fire Services Engineer to comment on omission of bottom sprinkler. • Stretcher facilities required, provided, compliant? Vertical Transport Engineer. • Lift shaft and car to contain a lid/roof? Vertical Transport Engineer. • Compliance with all relevant areas of Part E3? Vertical Transport Engineer.	C1.1 E1.5 E3.2 TBC Part E3
M	Closed Out.	-	-
N	Closed Out.	-	-

Item No.	Item	Comment	BCA Clause
O	Closed Out.	-	-
P	Closed Out.	-	-
Q	All areas – Floor cavity fire services protection requirements.	The Fire Services Engineer is required to comment on the space/cavity below the false floors in relation to the non-provision of smoke detection, when considering the requirements of AS 1670.1-2015. And non-provision of sprinklers when considering AS 2118.1-1999. The construction of the floor material is combustible.	E2.2
R	Barrier Heights	Further detail in relation to the barrier/guard rail heights is required to be illustrate for further assessment. This includes but is not limited to the fall protection between the front row seating, existing and proposed details required. And the Box Seating and Choir Stalls.	NSW H101.14.1-3, NSW D2.16
S1	Handrails to new and refurbished steps/stairs, in areas outside of the theatre.	Plans to be updated to illustrate not less than two handrails to areas not deemed exempt from persons with disabilities, all other areas not less than 1 handrail. 1 m unobstructed path of travel required between low occupant frequency handrails, greater to high frequency crowd areas.	D2.16/2.17 D3.3, see Table 6 below.
S2	Handrails to new and refurbished steps/stairs, in areas inside the theatre.	To be illustrated to the sides of the refurbished steps, if there is more than one step between platforms.	NSW-H101.13.3
T	New Stage Floor - Resulting Void space?	The details of the new stage floor are yet to be illustrated however if a void is created below the Fire Services Engineer will need to consider any services requirements.	E2.2, E1.5
U	Closed Out.	-	-
V	Closed Out.	-	-
W	No Scale Bar.	Regardless of the nominated scale, the plans are required to contain an accurate scale bar.	-

Item No.	Item	Comment	BCA Clause
X	Deleted	-	-
Y	Removed from scope.	-	-
Z	Closed Out	-	-
A1	Closed out.	-	-
B1	Fire Hazard Property Compliance	Aconex GDLA-ADVICE-000143 dated 16 Oct 2017 requests that an attached Fire Hazard Property Schedule be completed and return to GDLA for further population and review. This issue is urgent as it is likely that non-compliances will exist that will need to be considered by the Fire Safety Engineer. The entire wall system is to be included, i.e. fir W.L0.04 include the products: • WTM-11 • WBA-03 • WBA-35a35	C1.10
C1	Closed Out.	-	E1.5
D1	New Automated/removable Stairs to the rear of stage.	Further detail and understand of the operation and specific purpose required for further assessment against various BCA provisions.	Various

Table 3 – Request for Further Information

2.0 Introduction

The review has been limited to the Concert Hall Schematic Drawings which do not detail sufficient information to allow a full BCA report to be produced. The architectural plans are yet to be developed to the extent that a complete BCA assessment can be concluded and therefore this report is preliminary only. The plans are suitable for DA submission as the non-compliant items are WIP and will comply prior to the issuance of the relevant Crown Building Works Certificate.

The report is prepared based on a review of the documentation listed in Table 4 and the information provided by the client and is intended for their use only.

Reporting Team

The information contained within this report was prepared by Shane Berry, Accredited Certifier Grade A1 (BPB0721) and reviewed by Brett Clabburn, Accredited Certifier Grade A1 (BPB0064) from Group DLA.

Current Legislation

The applicable legislation governing the design of buildings is the Environmental Planning and Assessment Act 1979.

Final confirmation on the building approval mechanism has been received the works will be approved via a Crown project building permit. The provisions of Section 109R (Crown Building Work), of this act require that the building work be carried out in accordance with the Building Code of Australia 2016 (BCA). The application of compliance with the particular version of the BCA is the date on which tenders are issued.

All new works are required to comply with the current/relevant BCA. It is expected that a number of existing deficiencies with regard to existing compliance will be noted as the design progresses. Rectification is required in some instances due to the potential for the proposed works to make certain situations worse in terms of fire safety. Notwithstanding this, any project team required upgrades of the existing building fire services and egress provisions have been discussed below.

In regards to BCA 2016, the changes are minimal that relate to this building and as such do not have a material effect on the design of the building. These changes have been outlined below in order to assist the relevant disciplines. Consultants are to be aware that it is expected that this building will be a BCA 2016 compliant building.

Changes as a result of BCA 2016 – Applicable to the Sydney Opera House Project Only:

- Clause A1.1 – Performance Solution: The term Performance Solution has changed to Performance Solution.
- Clause A1.1 – *Boiler*: A new defined term "*boiler*" has been inserted as a consequence of including Specification G2.2.
- Clause A1.1 – *Effective height*: The defined term has been amended to clarify the lowest storey selected for determination, in line with the way we determine *rise in storeys* of a building.
- Clause A1.1 – *Fire-protected timber*: A new defined term has been inserted as a consequence of including provisions for *fire-protected timber*.
- Clause A1.1 – Functional Statement & Objective – These terms have been deleted and are no longer used in the BCA.
- Clause A1.1 – Pressure vessel: A new defined term "*pressure vessel*" has been inserted as a consequence of including Specification G2.2.

- Clause A1.8 – Explanatory Information: A new Clause introduced to advise that any BCA detailed explanatory information is non-mandatory.
- Specification A3.1 – AS/NZS 1428.4.1-2014 Amendment 2 has been adopted. Design for access and mobility — Means to assist the orientation of people with vision impairment — Tactile ground surface Indicators.'
- Specification A3.1 – AS 1530.4-**2014** has been adopted. Methods for fire tests on building materials, components and structures — Fire resistance tests for elements of construction.
- Specification A3.1 – AS/NZS 1668.1-**2015** has been adopted. The use of ventilation and air conditioning in buildings — Fire and smoke control in buildings. Mechanical Engineer to note.
- Specification A3.1 – AS 1670.1-**2015** has been adopted. Fire detection, warning, control and intercom systems — System design, installation and commissioning — Fire. Electrical and Fire Services Engineer to note.
- Specification A3.1 – AS 1670.4-**2015** has been adopted. Fire detection, warning, control and intercom systems — System design installation and commissioning — Sound systems and intercom systems for emergency purposes. Electrical and Fire Services Engineer to note.
- Specification A3.1 – AS 1905.1-**2015** has been adopted. Components for the protection of openings in fire-resistant walls — Fire-resistant doorsets.
- Specification A3.1 – AS 2293.3-2005 has been adopted. Emergency escape lighting and exit signs for buildings — Emergency escape luminaires and exit signs.
- Specification A3.1 – AS/NZS 3500.3 - **2015** has been adopted. Plumbing and drainage — Stormwater drainage. Hydraulic Engineer to note.
- Specification A3.1 – AS 5637.1-2015 has been adopted. Determination of fire hazard properties — Wall and ceiling linings. AS IOS 9705 has been deleted.
- Verification Method BV2 - A new Verification Method has been inserted to verify compliance with Performance Requirement BP1.1(a)(iii). BV2 is a means for verifying the structural robustness of a building.
- Clause C1.13 – New Clause included to allow fire-protected timber to be used wherever an element is required to be non-combustible, subject to certain things as noted in the clause.
- Specification C1.13 – New Specification included for fire-protective timber.
- Specification C1.10 – Amended to illustrate that we are no longer use AS IOS 9705 or AS/NZS 3837 for determining the materials group numbers for fire hazard properties. The new Standard is AS 5637.1.
- Clause D1.13 - The provision has been amended to clarify that it is to be used to determine the number of persons accommodated for certain Deemed-to-Satisfy Provisions. It is not intended to restrict the number of occupants using a building.
- Clause D2.13 – The provision has been amended to allow dimension tolerances for stair (step construction.)
- Clause D2.25 – New Clause included to permit the use of timber within a fire-isolated stairway or fire-isolated passageway subject to certain conditions.
- Clause F2.3(a) - Clarification has been added that sanitary facilities for males and females must be separate unless otherwise permitted.
- Table F2.3 - Clarification has been added that sanitary facilities for patrons need not be provided shopping centres and department stores where the total number of persons accommodated in the building is not more than the 600.
- Verification Method FV4.1 - A new Verification Method has been inserted as an option to verify compliance with Performance Requirements FP4.3 and FP4.4(a). It is a means for verifying that a building ventilated with outdoor air has suitable indoor air quality.
- Verification Method FV4.2 – A new Verification Method has been inserted as an option to verify compliance with Performance Requirements FP4.3 and FP4.4(a). It is a means for verifying that a carpark ventilated with outdoor air has suitable indoor air quality. The new Verification Method is applicable to Class 7a buildings only.

Premises Standard

As of 1 May 2011 new buildings and existing buildings being refurbished have to comply with the Disability (Access to Premises – Building) Standards ("Premises Standards") under the Commonwealth Disability Discrimination Act 1992.

The main requirement to come from the Premises Standard relates to the upgrading of the *affected part*[1], including the principal pedestrian entrance and the paths to the area of new works. The definition of *affected part* is limited to the area between (and including) the principal pedestrian entrance and the new work. This may include the requirement to upgrade the following existing areas:

- Entrances
- Accessible sanitary facilities.
- Lifts to upper storeys, either upgrade or provide lifts if they are not existing.
- Passing and turning spaces in corridors.

Various concession or relaxations do apply to certain items mentioned above.

A consideration for upgrade via the Premises Standard is applicable to the following existing building situations:

- Where an application for a Construction Certificate ("CC") or Complying Development Certificate ("CDC") has been received and the applicant for the works is the building owner or building manager; or
- Where an application for a CC or CDC has been received and the building is leased & occupied by a single tenant; or
- The works as deemed Crown development.

Fire Brigade

Fire & Rescue NSW ("FRNSW"): The EP&A Regulations 2000, Clause 144, requires buildings the subject of Construction Certificate approval to be referred to FRNSW. Clause 144 refers to EP&A Regs defined Category 2 Fire Safety Provisions[2]. If any of these measures are required to be considered as an Performance Solution due to DtS non-compliances identified within a design, and the floor area of a fire compartment exceeds 2000 m^2 or the floor area of the building exceeds 6000 m^2, the Clause 144 referral to the FRNSW is required. It is common practice to adopt this process on Crown projects under a voluntary submission. This design currently contains the following DtS non-compliance Category 2 Fire Safety Provisions or BCA Performance Requirements: EP1.4, EP2.2.

The process involves initial input from FRNSW at the Fire Engineering Brief Questionnaire ("FEBQ) stage and then official Lodgement of the Performance Solution Report by the PCA or Crown Certifier.

Under recent changes to the legislation the brigade are required to respond within10 advising whether or not they will be proceeding with a review and providing the Initial Fire Safety Report. If so the have not more than 28 days form the initial to provide their report or the PCA can choose to invoke the provisions of Clause 144(6A)(c) and issue the Construction Certificate after 28 days of officially lodging the Clause 144 application; further consultation is required on this issue. This may see a requirement for a peer review by an independent C10 accredited fire safety engineer.

At this stage in the design we have noted possible Alternative Solutions that require report and consent to the brigade, i.e. egress issues, shared fire services, etc.

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[1] *An affected part is: (a) the principal pedestrian entrance of an existing building that contains a new part; and (b) any part of an existing building, that contains a new part, that is necessary to provide a continuous accessible path of travel from the entrance to the new part.*

[2] *Category 2 fire safety provision means the following provisions of the Building Code of Australia, namely, CP9, EP1.3, EP1.4, EP1.6, EP2.2 and EP3.2 in Volume One of that Code.*

Limitations

- This report did not include assessment of the documentation against the provisions of the Disability Discrimination Act 1992 or (access to premises buildings) Standards 2010.
- This assessment is limited to the developed documentation at the date of this report and as referenced within the "Documentation Assessed" section of the Report.
- Any roof top plant or the like has been assessed as open to the sky.
- The travel distances have been assessed on an open plan basis with an allowance made for travel around pending fitout partitions. It cannot be taken as accurate when considering future fitout parameters.

Historic Fire Engineering

It is recognised that there are a large number of Fire Engineered Reports (50+) that have been created over time for the Sydney Opera House various projects. Whilst we will not be conducting a review of these existing FER's we will however require confirmation from the Fire Safety Engineer that the Concert Hall project design will not adversely affect or contravene any of the parameters or Alternative Solutions noted in the these existing FER's.

Upgrade Strategy

The Department of Planning are required to consider whether or not the existing building be brought up to a current level of fire safety (fire upgrades) as part of their required Section79C consideration. However, it is recommended that an over-arching strategy document is produced by the Fire Safety Engineer which will detail a justifiable approach to dealing with the existing limitations of the Sydney Opera House and those detail within the past FER's.

This Fire Engineered Strategy document will be required to be legalised via inclusion within the Concert Hall State Significant Development as a referenced document, and more importantly, call up in one of the SSD Conditions. Further consultation with the project Town Planner and Fire Safety Engineer, however we have had discussions with the Fire Safety Engineer and they are partial to this approach.

Please also note the Premises Standard upgrade comments for persons with disabilities as noted above.

3.0 Building Description

The Project

The overall project consist of a budget of $202 million for the initial design phase. The Concert Hall is only a portion of this amount. The Concert Hall related works consist of:

- Creation of an accessible wheel chair paths of travel, inclusive of extensive works to create an eastern tunnel cut in to the existing Level 2 stairs.
- Extensive egress and access stair redesign, replacement and upgrades.
- Refurbishment and extension to the above stage ceiling plant/access platform areas to create a new Tech Zone and allow for plant relocation.
- Back of House refurbishment works.
- Stage refurbishment including automated platform floors.
- New Lifts – 29 & 30.
- Extensive seating upgrade.
- Refurbishments to Rehearsal & Dressing Rooms.
- Various sanitary facility inclusions and upgrades for DDA compliance improvements
- Lift 1 - light refurbishment.

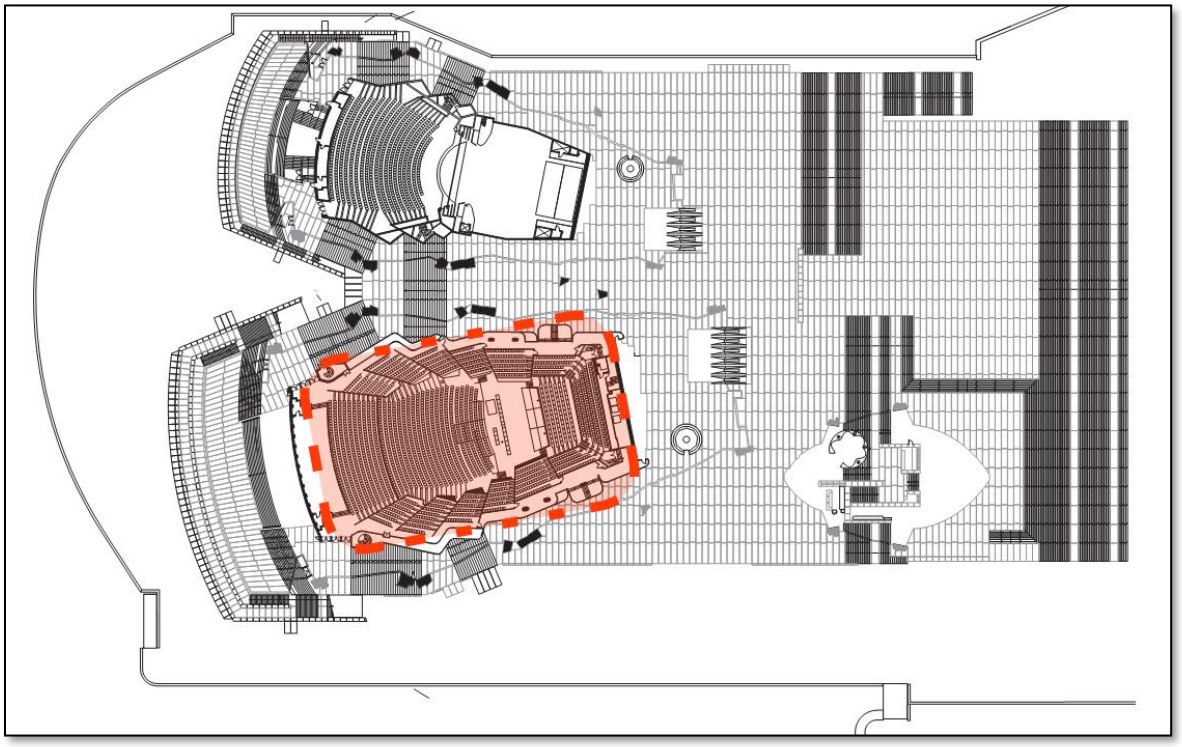

Figure 2 – Concert Hall

Building Description (Concert Hall Only)

Building Use & Class of Occupancy:	Class 9b *entertainment venue*
Type of Construction:	A
Floor Area of Building:	TBC by architect
Max Fire Compartment Size:	TBC by architect
Rise in Storeys:	TBC
Levels Contained:	TBC
Effective Height:	TBC
Climate Zone:	5

The Building Classifications are subject to change pending a review of historic approvals documentation.

Documentation Assessed

This report is based on the following documentation

Description	Drawing No.	Revision	Date
SOH Accessibility Master Plan 2015	Section 8.4	C	2.10.15
Development Application Architectural Plans	BRN-ARM-RPT-AR-0033(F)	F	22.08.2018
Arup Level +12, Ground Compartmentation Review (Phase 2 Update) Plan	Level +12, Ground	-	22.09.2016
Arup - Draft Fire Engineered Report for 100% Tender Documentation 243928-06	-	A	22.11.2017

Table 4 – Documentation Assessed

4.0 BCA Requirements

The following assessment will provide an overview of compliance with the BCA and identify issues that require attention at this particular stage of the development.

The architectural plans are yet to be developed to the extent that a complete BCA assessment can be concluded and therefore this report is preliminary only. The plans are suitable for DA submission as the non-compliant items are WIP and will comply prior to the issuance of the relevant Crown Building Works Certificate.

Section A – General Provisions

The BCA Classifications in relation to the overall SOH will need further consideration. A review of previously requested historic approval documentation remains outstanding.

Section B – Structure

The impact of the development in relation on the existing building will need to be considered by the Structural Engineer. All new works are required to comply, including an assessment by the Engineer against the earthquake provisions.

Section C – Fire Resistance & NSW H101

C1 – Fire Resistance and Stability

Further assessment of the developed documentation is required before an assessment against this part of the BCA can be completed. Architectural fire rating (FRL) plans will need to be developed off the back of the recent Fire Compartmentation Plans dated 22 September 2016. Fire ratings for this project are to be in accordance with Table 3 of BCA Specification C1.1, see Appendix A, except where dictated by past Fire engineering Reports which see a general requirement for 60 minutes to non-loadbearing reports.

There are a number of new floors proposed as part of infill etc. These floors are required to be no less than concrete with a 120/120/120 FRL. Any new elements supporting the floors should also be rated at 2 hrs, i.e. Level 2 columns/beams supporting the Choir Stalls, etc.

Level 8 & 9, will be developed to form a room similar to a plant room, which includes new floor area. The floor is required to contain a 120/120/120 FRL, and any supporting part. It is understood that this may not be achievable due to the existing non-fire-rated supporting structure and access floor. The Fire Safety Engineer has developed a Performance Solution to justify. Level 6 Port Galleries have been illustrate with new floor area also. Further plan detail is required to assess whether or not the BCA requires this area to be fire rate, i.e. enclosed by walls? Significant equipment? Etc.

Lift 29 & 30 – Inadequate level of BCA DTS fire rating to support members achieved. The Fire Safety Engineer has developed a Performance Solution to justify.

BCA Specification C1.1 Clause 2.4 & 4.1(b) illustrates the restrictions on using combustible wall cladding. Such non-compliant products include but are not limited to certain Alucabonds, Apolic, Kingspan, timber, etc. Fire engineered alternative solutions may be possible but unlikely for areas around the exits and above the fire services. Please advise of any locations where such products are to be used in the form of colour coded elevations, for further assessment. This provision also applies to the proposed new concrete column cladding.

The Fire Hazard Properties of floor linings and floor coverings, wall and ceiling lining's, and other material as noted within Clause C1.10, must comply with the provisions of Specification C1.10 and NSW Specification C1.10, as noted in Table 5 below. This includes any specialist acoustic linings or treatments. It is recommended that the Fire Hazard Property Test Reports of the various linings and coverings are submitted to this office for a compliance check prior to installation. Notwithstanding this they will be required to be verified prior to the issuance of the OC, which is often too late in the case of the use of non-compliant materials.

This provision also extends to internal fire rated walls where a combustible attachment is permitted if the lining material complies with the fire hazard properties of Specification C1.10 (see table 5 below) and is not located near or directly above a fire exit. This issue occurs in a number of areas such as the, Level 2 East Passageway rated walls, which are proposed to have Brush Box slates/NFR panel cladding lined or other timber panel, and the stage surround contoured panel, which are unlikely to achieve a BCA defined *group number* of not less than 2. The actual materials group number of the cladding will need to be determined however Brush Box by itself only achieved *group number* 3 refer http://www.timber.net.au/index.php/fire-safety-fire-hazard-properties-wall-ceiling.html. The Fire Safety Engineer will need to consider the feasibility of a Performance Solution.

The Fire Hazard Properties of floor linings and floor coverings, wall and ceiling lining's, and other material as noted within Clause C1.10, must comply with the provisions of Specification C1.10 and NSW Specification C1.10, as noted in Table 5 below. This includes but is not limited to:

- Any specialist acoustic linings/skins or treatments for acoustics.
- Timber wall and ceiling panelling, including Wobbly Panel
- The brush box veneered. Note that the slotted system may not comply and needs to be considered by the Fire Safety Engineer.
- New claddings to the existing columns.
- New balcony/wall fronts to the Stalls, Boxes, Upper Circle, etc.
- New contoured wood panelling box front.
- New Orchestra Assembly Room timber floor.
- Timber panels to the East Passageway. And associated substrate which is currently noted as under review.
- Stage floor.
- Seating – However it is understood that recent tests for the JST seating have passed the Fire Engineered required testing standard. Confirmation that the Concert Hall seats are the same material and a copy of the successful test report is required. If it is not the BCA Test Report then it is understood that the Test Report will be used to justify a Performance Solution.

It is recommended that the Fire Hazard Property Test Reports of the various linings and coverings are submitted to this office for a compliance check prior to installation. Notwithstanding this they will be required to be verified prior to the issuance of the OC, which is often too late in the case of the use of non-compliant materials. Aconex GDLA-ADVICE-000143 dated 16 Oct 2017 requests that an attached Fire Hazard Property Schedule be completed for further review.

Item	Location	Requirement
Floor linings or coverings	All floor areas throughout the complex, except fire isolated stairs	*CRF of no less than 1.2

Item	Location	Requirement
Floor linings or coverings	Fire isolated stairs	CRF of no less than 2.2
Wall and ceiling linings	Fire isolated stairs	**Group Number 1
Wall and ceiling linings	Public Space	Group Number 1 or 2
Wall and ceiling linings	General Areas	Group Number 1, 2 or 3
Materials used as a curtain, blind or similar décor	Concert Hall	Flammability Index of not more than 6
Seats	Concert Hall	Spread of Flame Index of not more than 9, and a Smoke Development Index of not more than 8 if the Spread of Flame is more than 5.

Table 5 – Fire Hazard Properties

Note*: CRF stands for critical radiant flux, which is a BCA defined term as follows – *"Critical radiant flux means the critical heat flux at extinguishment as determined by AS ISO 92391.1 – 2003*." And for buildings not fitted with a sprinkler system complying with Specification E1.5, must have a maximum smoke development rate of 750 percent-minutes.

Note**: Group Number is a BCA defined term as follows – *"Group number means the number of one of 4 groups of materials used in the regulation of fire hazard properties and applied to materials used as a finish, surface, lining, or attachment to a wall or ceiling."* The *group numbers* must be determined in accordance with AS 5637.1 - 2015 and for buildings not fitted with a sprinkler system complying with Specification E1.5, must have—

- a smoke growth rate index not more than 100; or
- an average specific extinction area less than 250 m 2/kg.

As noted above the wall materials require a Materials Group Number of 1 or 2 in sprinklered public corridor areas and 1 in non-sprinklered public corridor areas. This may be an issue for the Brush box wall lining as it is not common for timber to achieve a Materials Group Number of 2, and even less common for a 1.

C2 – Compartmentation and Separation & NSW H101

Further assessment of the developed documentation is required before an assessment against this part of the BCA can be completed. Fire rating (FRL) plans will need to be developed as the design progresses.

Color coded fire rating plans have been developed by Arup, dated 22 September 2016. These are now required to be superimposed onto the proposed architectural plans for further assessment. There may be issued with the current wall types illustrated, TBC following a review of the updated plans.

An increase in fire compartmentation beyond that permitted by the BCA may exist due to the construction of the accessible tunnel at +042 Level 2, and the new entries to the theatre at Level 2. Further assessment of the FRL plans is required in order

to consider the developments fire compartmentation compliance levels. Any noted issues may need to be considered by the Fire Safety Engineer. The fire compartment plans are to illustrate existing and proposed floor areas and volumes.

It is understood that the new smoke exhaust unit on Level 8 & 9 will not be fire separated from the remainder of the Concert Hall, this item has been addressed by the Fire Safety Engineer as a Performance Solution.

The BCA requires lift shafts to be fire isolated where they pass through more than 2 storeys or more than 3 in a sprinkler protected building. Lift 29 & 30 connect more than 2 storeys in a building which is not fully sprinkler protected and is therefore required to be in a fire rated shaft of 120/120/120 FRL. The Fire Safety Engineer has developed an Performance Solution to justify. *(BCA Clause C2.10)*

Additionally, the shaft lid is required to be fire rated and is glass, this will also need to be considered by the Fire Safety Engineer. *(BCA Clause C1.1, Specification C1.1 Clause 2.7)*

Lift motors and lift control panels are required to be separated from the remainder of the building by an FRL of not less than 120/120/120. Lift motor room not fire separated from the remainder of the building. A new Performance Solution is pending for the lift motor room inadequate separation, from the Fire Safety Engineer.

The Rack Room L1.RR.01 may also need to be fire rated if it contains a battery or batteries that have a voltage exceeding 24 volts and a capacity exceeding 10 ampere hours. Electrical Engineer to confirm. *Ref: BCA Clause C2.12*

C3 – Protection of Openings

Further assessment of the developed documentation is required before a full assessment against this part of the BCA can be completed, i.e. the pending FRL plans will need to be considered.

If any of the proposed fire doors are to either be glass or timber with a vision panel, consideration to the following will need to be given in terms of design:

- Vision panel design - DDA requirements for the size and location of the panel. Refer AS 1428.2 and liaise further with the Access Consultant.
- Vision panel design - The Fire Safety Engineer will also need to approve the size of the panels.
- Vision panel design - There may or may not be a conflict with the required size of the panels v's the parameters in the testing Standard and permitted exceptions. There may or may not be a requirement for the door design to be tested as a bespoke model.
- Glass doors – The required FRL rating of -/120/30 may not be achievable and the Fire Safety Engineer has confirmed that this is a justifiable Performance Solution.
- Attachments are not permitted to fire doors. Further assessment of the FRL is required. The plans do not currently nominate the required or existing fire doors.

Services penetrations in fire rated walls/floors/ceiling/etc are required to be in accordance with BCA Clause C3.15. Specification C3.15 illustrates specific parameters on such matters as the size and proximity of services to each other. This part can be superseded by an actual fire test report of the service and installation method. It should be noted that the current services documents appear to illustrate proposed services too close to each other or existing services. Further review from the Engineer designing the service installation should be completed to mitigate any issue here. Please be advised that test reports will be required for the installation of services that are not in accordance with the parameters noted in specification C3.15, and that the service installation and fire protection are to be installed in accordance with the tested prototype.

Section D – Access & Egress

D1 – Provision for Escape

The BCA maximum permitted travel distances are 20 m to an exit or to a point in which travel in two different directions to two different exits is available, 40 m to the nearest exit of the two measure back from the starting point and 60 m between alternative exits measure through the point of choice.

All paths of travel are required to be no less than 1 m generally speaking, or more in the case of aggregate and compounded auditorium widths. All paths of travel are required to be dimensioned for further assessment. There appears to be issues with regard to the replace and/or refurbished back of house stairs containing paths of ravel which may be less than 1 m (or more if required by the Fire Safety Engineer.) Note that handrails are required to both sides of the stairs.

The egress review has noted the following items:

a) Closed out.

b) Levels 7a, 8 & 9 - The use of new ladders for egress in lieu of fire isolated stairs. Level 9 (2 x Ladders to L8), to Level 8 (2 x existing stairs, 1 x new spiral stair) to Level 7A (1 x spiral stair) in lieu if fire isolated exits. Non-compliant discharge of exits, i.e. to intermediate storeys rather than direct to openspace, i.e. new spiral stair discharge to L7, Ladders to L8, etc. Ref BCA Clause D1.6, D1.7.

c) Closed out - Reduced width to the eastern side foyer steps due to the introduction of the Level 2 Tunnel. This item has been addressed as a Fire Engineered Solution. *Ref BCA Clause D1.6.*

d) Closed out.

e) Closed Out.

f) Closed out.

g) Ground Level – Compliant travel distances, or existing travel distance that have not been increased, have been illustrated. Closed out.

h) Ground Mezzanine - Compliant travel distances, or existing travel distance that have not been increased, have been illustrated. Closed out.

i) Closed out.

j) Level 2 – The changes to the main fire Stair 15 (west core) are considered an improvement on existing conditions, however further detail of the services cupboard arrangement either side of the entry/exit door is required, i.e. is it to be fire separated from the fire stair with fixed solid construction as per the exist backing wall, see Arup Fire rating plans. Arup have request an investigation of these cupboards, upgrading to be fire rated is likely.

k) Closed out.

l) Level 5, 6 & 7 Plant room changes are considered minor and DO NOT require a re-assessment of the existing/proposed egress in these areas. Other than all new and existing equipment to be illustrated in box format only, and paths of travel to be dimensioned for further review and comment.

m) Level 7a / 8 – Further detail of the Crown Access spiral stair is required for further assessment. The following potential issues are noted for further review at this stage of the design:

- The minimum unobstructed width is to be no less than 1 m.
- The riser and tread dimensions are to be in accordance with BCA Clause D2.13 and measured in accordance with Note 2 of Table D2.13, see immediately below.

2. The going in tapered treads (except winders in lieu of a quarter or half landing) in a curved or spiral stairway is measured—

   (a) 270 mm in from the outer side of the unobstructed width of the stairway if the stairway is less than 1 m wide (applicable to a non-*required* stairway only); and

   (b) 270 mm from each side of the unobstructed width of the stairway if the stairway is 1 m wide or more.

n) Level 8 – Exits to be identified for further assessment. Does not appear to be a required northern exit illustrated. Required exits to be nominated on the FRL plans for further assessment.

o) Level 9 – Exits from middle platforms L09.04 & 05 to be illustrated for further assessment.

p) All Plant / Platforms / Tech Zones / Winch Room, etc. require the 1 m by 2 m path of travel to exits to be illustrated for further assessment.

q) Now item b above.

r) All exits to be identified on the pending FRLs, including upper level plant.

s) 1 m path of travel to be illustrated between required handrails (handrails required to both sides in most cases) to new and altered stairs and ramps.

STORE L2.ST.01 opens directly into the main egress fire Stair 15, contrary to the provisions of the BCA. Design change required to illustrate compliance, i.e. air lock.

D2 – Construction of Exits

Balustrades/barriers for stairs are required to be no less than 1 m above landings, stair nosing lines and windows. Balustrade gaps in excess of 125 mm general are not permitted, however fire stair baluster gaps can be as much as 150 mm above the nosing or floor lines and 460 mm elsewhere.

Further assessment of the developed documentation is required before a full assessment against this part of the BCA can be completed, including guard railing and the to the seating projects.

Balustrades for stairs are required to be no less than 1 m above landings and 1000 mm above stair nosing lines and windows. Balustrade gaps in excess of 125 mm general are not permitted, however fire stair baluster gaps can be as much as 150 mm above the nosing or floor lines and 460 mm elsewhere.

It is worth noting at this stage that if fire-isolated stairs are also to be used as communication stairs then additional design requirements will also need to be consider in line with BCA Clause D3.3 and Clause 11/12 of AS 1428.1-2009. Such requirements include but are not limited to:

- Tactile Ground Surface Indicators.
- Handrails to both sides of the stair flights.
- Fully accessible handrails.

Table 6 illustrates the various requirements for the various stair scenarios for your convenience. These requirement are applicable to all of the proposed stairs.

Proposed handrails require further design consideration as it is understood that they may be design to match the existing handrails. A justifiable Performance Solution form the Access Consultant will be required. It is understood that a holistic review is currently underway.

The new door latching and openable operation is required to comply with the provisions of BCA Clause NSW D2.101, NSW D2.19 & NSW D2.21, which includes the provision for panic bars to areas that contain more than 100 occupants. The exit

doors and doors in the path of travel to exits have not been illustrated with compliant push bars. Therefore all doors are required to failsafe release on activation of fire trip anywhere within the building.

All exit doors and doors in the path of travel to exits are required to open manually under a force of not more than 110N for fire egress. A much lessor force of 20N is required for doors in the accessible areas, please refer to the Access Consultant for further comment.

All new plant style BOH ladders and the like are required to comply with AS 1657-2013. This also includes the removable steps to the stage and their associated hand rails. *Ref BCA Clause D2.18.*

Slip Resistance – All surfaces require slip resistance ratings in accordance with AS 4586-2013 as follows:

- Ramps steeper than 1:14 – P4 Dry or P5 Wet.
- Ramps Steeper than 1:20 but not steeper than 1:14 – P3 Dry or P4 Wet.
- Treads and Landings - P3 Dry or P4 Wet.
- Nosings or Landing Edge Strips - P3 Dry or P4 Wet.
- Other area – Slip resistant as required by AS 1428.1-2009, Access Consultant to determine the actual required rating.

Level 1 - New threshold ramps at internal doorways and corridors not permitted:

- Male and Female WC.
- AWC.
- STORE (west).
- LOCKER ROOM.

Must only be position at doorways which open to a road or open space. Access Consultant to review and comment.

Stair	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
Fire Isolated Stair	**NO** - Only minor provisions made for egress.	**YES** - 1 handrail required which must resemble that required by the accessibility provisions, i.e. • 180° handrail turndown or return to wall, 300 mm past last riser. • 30 to 50 mm diameter with a 270° clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270° to the top of the handrail. *Ref: BCA D2.17, D3.3(a)(iii) & Cl 12 of AS 1428.1-2009.*	**YES** - No less than 1000 mm above stair nosing lines, no less than 1 m above landings. No openings greater than 300 mm OR in the case of rails, top rail, mid rail and bottom rail required. No gaps greater than 150 mm above nosing line and 460 mm between rails. *Ref: BCA D2.16(g)(h)(i)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 75 mm. Strip may be set back 15 mm from the front edge of the nosing but where it is not set back the luminance contrast must not extend down the riser by more than 10 mm. The lip between the tread and strip must not exceed 3 mm, or 5 mm where the edges are chamfered. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	**Tread -** 250 to 355 mm. **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Permitted to 125 mm. **Stair Width** - Minimum unobstructed width of 1000 mm, measured clear of handrails. Note: 1000 mm clear width will only allow for 100 persons, occupancy quantity review may be required. **Stair Height Clearance** - No less than 2 m. *Ref: BCA D2.13, D1.6*	**NO**	- Lip of the nosing strip excessive in height. - No site allowance for balustrade tolerances. - If separate handrail and balustrade is not used, this usually causes a conflict with the requirement to have the same heights throughout the landings and stairs. - Tread and riser dimensions not constructed uniform in dimension.
Fire Isolated Stair & Communication Stair	**YES**	**YES** - Fully accessible handrails required to both sides as follows: • 180° handrail turndown or return to wall, • 30 to 50 mm diameter with a 270° clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270° to the top of the handrail.	**YES** - No Less than 1000 mm above stair nosing line, no less tanh 1 m above landings. No openings greater than 125 mm. No climbable members between 150 and 760 mm where the floor level is 4 m or more above the surface beneath. *Ref: BCA D2.16(g)(h)(ii)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 75 mm. Strip may be set back 15 mm from the front edge of the nosing but where it is not set back the luminance contrast must not extend down the riser by more than 10 mm. The lip between the tread and strip must not exceed	**Tread -** 250 to 355 mm. **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Not permitted, must be opaque. **Riser Splay back -** Be vertical or max 25 mm. **Stair Width** - Minimum unobstructed width of 1000 mm, measured clear of handrails. Note: 1000 mm clear width will only allow for 100 persons, occupancy quantity review may be required. **Stair Height Clearance** - No less than 2 m.	**YES -** Required to the top and bottom of landings. No requirement for the mid landing. Note: It is understood that BMPX are seeking an Performance Solution to delete TGSI in this case. Access consultant to confirm. *Ref: BCA D3.8, AS/NZS 1428.4.1-2009*	- Lip of the nosing strip excessive in height. - Outer handrail not continuous due to allowing for fire hydrant equipment. - No site allowance for balustrade tolerances. - If separate handrail and balustrade is not used, this usually causes a conflict with the requirement to have the same heights throughout the landings and stairs. - TGSI are not desirable in most cases and therefore an Performance Solution by an accredited access consultant will be required, which usually required dome indicator buttons on the handrails. - Tread

Stair	Access for person with Disabilities	Handrails	Balustrade	Slip Resistance	Treads, Risers, Widths, Other	TGSI	Common Issues
		Ref: BCA D2.17, D3.3(a)(ii) & Cl 11 & 12 of AS 1428.1-2009.		3 mm, or 5 mm where the edges are chamfered. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	*Ref: BCA D2.13, D1.6*		and riser dimensions not constructed uniform in dimension.
Interconnecting Communication Stair (between tenancy levels not required as fire egress/exit)	**YES**	**YES** - Fully accessible handrails required to both sides as follows: • 180° handrail turndown or return to wall, • 30 to 50 mm diameter with a 270° clearance around the top of the handrail, • 50 mm clearance to back of handrail, and to a height of 600 mm above the handrail. • Located between 865 mm and 1 m above nosing line. And must be at consistent height through the stairs and landings. • Continuous rail, no handhold breaks. • Clear area for 270° to the top of the handrail. *Ref: BCA D2.17, D3.3(a)(ii) & Cl 11 & 12 of AS 1428.1-2009.*	**YES** - No Less than 1000 mm above stair nosing line, no less tanh 1 m above landings. No openings greater than 125 mm. No climbable members between 150 and 760 mm where the floor level is 4 m or more above the surface beneath. *Ref: BCA D2.16(g)(h)(ii)*	**YES** - P3 rated slip resistance and highlighted nosing's to no less than 30% luminance contrast to the background. Nosing widths to be between 50 & 75 mm. Strip may be set back 15 mm from the front edge of the nosing but where it is not set back the luminance contrast must not extend down the riser by more than 10 mm. The lip between the tread and strip must not exceed 3 mm, or 5 mm where the edges are chamfered. *Ref: BCA D2.13, D2.14, D3.3(a)(iii) & Cl 11, 7.2, 7.3 of AS 1428.1-2009.*	**Tread -** 250 to 355 mm. (Public) **Tread** - 240 to 355 mm. (Private) **Riser** - 115 to 190 mm. **Quantity** - Must be between 550 to 700 when applying (2 x Riser + Tread.) **Open Riser** - Not permitted, must be opaque. **Riser** **Splay back -** Be vertical or max 25 mm. **Stair Width** - Minimum unobstructed width of 1000 mm, measured clear of handrails. Note: 1000 mm clear width will only allow for 100 persons, occupancy quantity review may be required. **Stair Height** - No less than 2 m. *Ref: BCA D2.13, D1.6*	**YES -** Required to the top and bottom of landings. And around base of stair stringer or stair when it can be considered as an overhead obstruction within 2 m from floor level. *Ref: BCA D3.8, AS/NZS 1428.4.1-2009*	- Lip of the nosing strip excessive in height. - No site allowance for balustrade tolerances. - If separate handrail and balustrade is not used, this usually causes a conflict with the requirement to have the same heights throughout the landings and stairs.

Table 6 – BCA Stair Provisions

D3 – Access for People with Disabilities

Refer Access Consultants Report.

Orchestra Stage refurbishment is to include automated Forestage Lift. This appears to be a technical non-compliance with the BCA that may be required to be justified via an Performance Solution from the Access Consultant. Further understanding of the operation of this area is required, i.e. will the Forestage Lift comply with BCA Clause E3.6?

Under the previous scheme, all of the 34 required wheelchair seating spaces were not to be provided on a permanent basis. The allocated spaces will contain removable seating to allow for more efficient use of the Hall, and that the wheel chair spaces will become available on an as needed basis. The ability to provide all 34 spaces is required to be demonstrated at the completion of the project as a prerequisite to the issuance of the OC. That is to say, if this project does not provide the infrastructure to allow for the 34 wheelchairs spaces, a non-compliance will exist which will need to be justified via a Performance Solution. *Ref: BCA Table D3.9.* The current plans illustrate an reduction of 6 wheelchair spaces, and therefore only 28 out of the required spaces are proposed.

The plans illustrate a grouping or wheelchair seating spaces in excess of 5 spaces to the Stalls areas. A justifiable Performance Solution is required from the Access Consultant in support. *Ref: BCA Table D3.9.*

Table 6 above illustrates the specific requirements for the various stairs.

The existing and proposed performance of hearing augmentation is required to be reviewed by the Access Consultant and relates to most areas of the Concert Hall precinct including the New Digital Class Room, auditorium, meeting rooms, and obviously the theatre itself. The Access Consultant is to advise if there are any shortfalls in relation to BCA compliance for further consideration. *Ref: BCA Table D3.7.*

Section E – Services & Equipment

E1 – Fire Fighting Equipment

Further assessment of the fire services plans is required for confirmation of location and coverage compliance with regard to the fire sprinkler system, fire hydrant system, fire hose reel system and fire extinguishers. The architectural plans will need to be updated to include the fire rated walls and doors as noted on the Arup Fire Compartment plans dated 22 September 2016.

The Fire Safety Engineer had commented with regards to new works requiring sprinkler protection to BCA and AS 2118.1-1999. This is not expected to extend to the site infrastructure meeting this requirement. The Fire Safety Engineer has requested area not currently containing to be provided with sprinklers to be identified for further retrospective improvement considerations.

All void spaces in excess of 200 mm are likely to require sprinkler protection in accordance with the sprinkler Standard or consideration of a Performance Solution is needed from the Fire Safety Engineer. There areas may include but are not limited to:

- The altered Stall and Choir sub-floors
- Any voids created as a result of flooring level changes, i.e. western sanitary changes to floor levels, etc.
- Understage area.

Level 2 Tunnel – Shortfall in sprinkler coverage and omission of fire separation from sprinkled to non-sprinkled areas. Fire Safety Engineer has confirmed the feasibility of a Performance Solution, refer Section 6.6 of Draft Fire Engineered Report for 100% Tender Documentation 243928-06 Rev A dated 22.11.2017

There may be a small number of area where there will be no fire hose reel coverage due to the proposed fire compartmentation changes, i.e. Store GM.03, Store L2.10, Rack Room L1.28, etc. The hose of the fire hose reel is not permitted to pass through fire and smoke doors. Once the proposed fire compartmentation plans have been developed the Fire Services Engineer can review and identify the related issues for the Fire Safety Engineer to consider justifying via Performance Solutions.

Any altered areas where the situation is such that sprinklered areas meet non-sprinklered areas are required to be identified by the Fire Services Consultant for further comment.

E2 – Smoke Hazard Management

The existing smoke hazard management systems are required to be carried over into the new and refurbished areas.

It has been confirmed that the Concert Hall does not have an adequate smoke exhaust system at less than $7m^3/s$. The Fire Safety Engineer has developed a Performance Solution to justify.

The majority of void spaces are likely to require smoke detection in accordance with the smoke detection Standard or consideration of a Performance Solution is needed from the Fire Safety Engineer. However the Fire Services Engineer would need to review and comment in relation to any new requirements/changes under AS 1670.1-2015. There areas may include but are not limited to:

- The altered Stall and Choir sub-floors
- Any voids created as a result of flooring level changes, i.e. western sanitary changes to floor levels, etc.
- Understage area.

E3 - Lift Installations

The BCA requires the following lift provisions to be implemented for this development:

- Stretcher facilities in accordance with Cause E3.2. Understood not to have been design to comply. Performance Solution from the Vertical Transport Engineer required.
- Emergency Lifts complying with Clause E3.4. Vertical Transport Engineer to confirm whether or not any of the prosed or altered lifts are required to be Emergency Lifts and confirm compliance or otherwise.
- Fire Services Controls complying with Clause E3.7 and E3.10.
- Fire Services Recall Control Switch complying with Clause E3.9.
- Warning signage, i.e. “Do not use lifts if there is a fire”
- Landings are to comply with the access and egress provision of Section D of the BCA. Compliance appears to have been achieved.
- The lifts must be a type of lift noted in Table E3.6(a) of the BCA.
- The lifts must have features in accordance with Table E3.6(b), i.e. handrails, certain dimensions, etc, as stipulated within this table.
- The lift car must have emergency lighting.

- Cooling of the lift shaft to ensure that the dry bulb air temperature in the lift shaft does not exceed 40°C and if the cooling is by ventilated system, be provided with an air change rate determined using a temperature rise of no more than 5 K.
- Emergency access doors may be required for these single enclosed shafts, vertical transport consultant to advise when considering the multiple prerequisites of Specification E3.1 Clause 6.

Furthermore the Fire Safety Engineer has commented on the possibility utilising lift evacuation principals taken from the ABCB guidelines Lifts Used During Evacuation Guidelines 2013. Justification to Performance Requirement DP7 is unlike as a result of their review and therefore no further advancements in this area have been made.

The Vertical Transport Engineer is required to confirm compliance with the above at all stages of the project.

Considering the light refurbishment of Lift 1, only the accessibility provisions of the BCA are to be upgraded. Unless this lift is deemed a goods lift only and is not part of the Premises Standards "affect part." Access Consultant and Vertical Transport Engineer to confirm.

Further discussion in relation to the Stage platform lift is required once a review of the developed design has been completed. The Vertical Transport Engineer and Access Consultant are required to confirm compliance with BCA Clause E3.6.

E4 – Emergency Lighting, Exit Signs and Warning Systems

Further assessment of the developed documentation is required before an assessment against this part of the BCA can be completed.

The BCA requires the following Emergency Lighting, Exit Signs and Warning Systems for this development, if the systems are proposed to be replaced or altered:

- Emergency lighting and exit signs are required to be installed throughout the building in accordance with the provisions of the BCA and AS 2293.1 - 2005.
- Sound Systems and Intercom Systems for Emergency Purposes (SSIPSEP, formerly EWIS) in accordance with AS 1670.4-2004 as required by the fire engineered strategy. And BCA Clause H2.14.

Concert Hall theatre - SISSEP (EWIS) sounders will not achieve speech intelligibility and strobes will be provided in support. Fire Safety Engineer has confirmed the feasibility of a Performance Solution, refer Section 6.7 of Draft Fire Engineered Report for 100% Tender Documentation 243928-06 Rev A dated 22.11.2017. However, the Performance Solution needs to recognise and justify E4.9 & EP4.3.

Any proposed exit signs installed at a height in excess of 2.7 m above floor level may require an Performance Solution from the fire safety engineer. Further confirmation from the electrical consultant is required.

Section F – Health & Amenity

F2-F2.4 Sanitary Facilities

There are proposed changes to the existing sanitary facilities and new sanitary facilities proposed. It is understood that form a holistic Renewal Project appreciation, that there is an increase in the number of facilities (including new accessible and ambulant) and no increase in the number of occupants to the Opera House. In fact it can be validly argued that there is actually a decrease in the number of occupants due to the sacrifice of able persons seating to make way for the new accessible wheelchair spaces. There the current level of compliance in terms of required sanitary facilities have been improved and no further comment is necessary.

The Sydney Opera House has provided a letter of confirmation to the effect that the overall number of facilities has not been reduced and the number of occupants has not been increased. Ref Letter *"Changes to toilet and patron numbers as a result of the SOH Stage 1 Renewal Projects (JST TMP, JST SAVE, Entry Foyer, Function Centre, Under the Steps, Creative Learning Centre and Concert Hall upgrades)"* issued by Ian Cashen dated 13 April 2017.

F3 – Room Sizes

The ceiling height must be not less than—

- Generally, 2.4 m; and
- More than 100 persons accommodating the area, 2.7
- A habitable room excluding kitchen; 2.4
- and a corridor, passageway, or the like — 2.4 m & 2.7 for more than 100 persons; and
- a bathroom, shower room, sanitary compartment, airlock, tea preparation room, pantry, store room, garage, car parking area, or the like — 2.1 m; and
- a commercial kitchen — 2.4 m; and
- above a stairway, ramp, landing or the like — 2 m measured vertically above the nosing line of stairway treads or the floor surface of the ramp, landing or the like.

Further assessment of the pending detailed plans is required, however the proposed Level 2 tunnels will have a low ceiling height, less than the required 2700 mm, actual TBC. The Ergonomics Consultant has justified a Performance Solution to allow a height of not less than 2100mm for the JST project and will need to consider this issue also.

F4 - Light and Ventilation

Design Certification will be required from the Mechanical and Electrical Engineers prior to the issuance of the Crown Building Works Certificate.

Artificial lighting must be provided to all rooms in accordance with AS/NZS 1680.0-2009.

The mechanical ventilation system must comply with AS 1668.2-2012.

Section G – Ancillary Provisions

G3 – Atrium Construction

The project design is not consider to require any enhancements to the existing fire safety systems as a result of our review of this Part of the BCA.

Part H – Theatres, Stages, Public Halls,

N/a, refer Part H101.

Part I – DELETED

N/a

Section J - Energy Efficiency

All new works are to comply with Section J.

The building is located within Climate Zone 5.

Compliance with Section J is required for this development, for new or altered works only, as follows:

- BCA Part J0 – Energy Efficiency – Noted, no action required.
- BCA Part J1 – Building Fabric – There are no material changes to the existing building envelope line, the works are within a space that is considered *conditioned space* under the BCA. Other than for the new roof section over Lift 29 & 30 which is considered like for like for the existing or an improvement to the current situation.
- BCA Part J2 – Glazing – Submission of an ABCB approved glazing calculator and details of the U and SHGC values of the proposed new external glazed walls to Lift 29 & 30 area is required for further assessment and comment. WERS data of the glazed window and door assemblies is also required as part of this assessment. Relaxations exist within the ABCB Handbook 2010 - Applying Energy Efficiency Provisions to New Building Work Associated with Existing Class 2 to 9 Buildings – Section 2.6.
- BCA Part J3 – Building Sealing – N/A as no new external doors, windows, vents, etc.
- BCA Part J4 – DELETED.
- BCA Part J5 – Air-conditioning and Ventilation Systems – Certification from the mechanical consultant will be required.
- BCA Part J6 – Artificial Lighting and Power – Certification from the electrical consultant will be required.
- BCA Part J7 - Hot Water Supply and Swimming Pool and Spa Plant – Installation and Commissioning Certification from the Plumbing Contractor will be required prior to the issuance of the Occupation Certificate if new hot water supply is proposed. Compliance with the NCC Plumbing Code of Australia required.
- BCA Part J8 – Access for Maintenance and Facilities for Monitoring – Design Certification from the services consultant will be required in relation to BCA Clause J8.3, prior to the issuance of the Crown Building Works Certificate.

NSW Part H101 – Entertainment Venues

Further assessment of the developed documentation is required against this part of the BCA.

It is noted that the new wheelchair seating spaces will be located in both continental seating and non-continental seating areas. Further assessment of the impact in egress and the general compliance of the removable seating will be required as the design progresses.

However at this particular stage in the design, further consideration will need to be given to the following provisions:

- NSW H101.2 Fire Separation – Further review of the architectural FRL plans is required in relation any required fire separation and altered areas along the required compartmentation lines.
- NSW H101.3 – In relation to any proposed works which reduced the required foyer space, i.e. 0.25m^2 per persons, i.e. the extension of the entry air locks at Level 2 southern foyers. The architect will need to provide the current floor area and proposed floor areas for further assessment. Fire Safety Engineer to confirm number of occupants egressing to southern foyer as determined by past fire engineering reports.

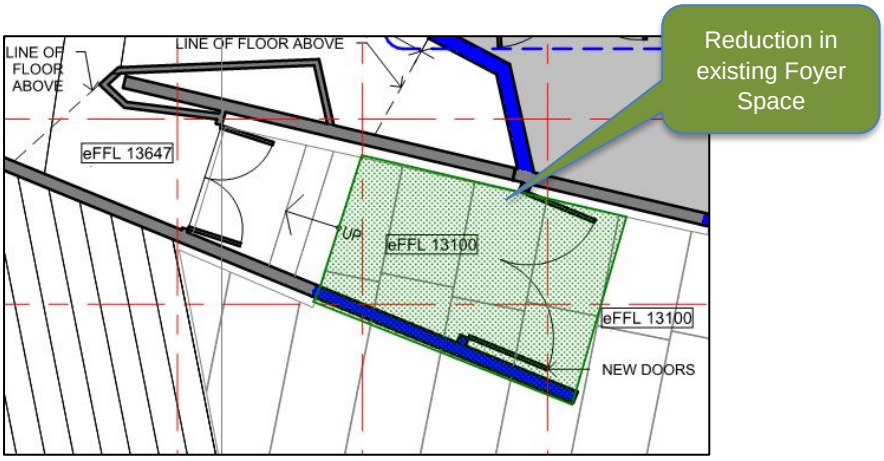

Figure 3 – Level 2 Theatre Entry Lobby

- NSW H101.4 Sprinkler Systems for Common Foyers – No changes are proposed that adversely impact on the existing conditions in relation to this provision.
- NSW H101.5 or 6 – Provision for separation at from the stage, egress form the stage, etc. Further review of the architectural FRL plans is required in relation to the BOH works.
- NSW H101.11.1 – No changes are proposed that adversely impact on the existing conditions in relation to this provision.
- NSW H101.11.2 – The new and removable chairs are expected to comply with this provision.
- NSW H101.11.3 – The carers chairs associated with the removable wheel chair spaces will contain a locking mechanism and thus comply with the requirements of this Clause as they will be fixed in place.
- NSW H101.11.6 – Aisle and Crossover widths. Reduction to less than 1 m to the Upper Circle isle widths as caused by the new stair arrangements, to the first 2 rows of seating, Fire Safety Engineer to confirm feasibility of a justifiable Performance Solution.
- NSW H101.11.7 – Platforms and Steps. Further dimensioned detail of the altered Upper Circle platform steps is required for further assessment.
- NSW H101.12.3 – The depths of the altered seating rows will need to be considered against the provisions of this Clause.
- NSW H101.12.4 – The clearance of the altered seating rows will need to be considered against the provisions of this Clause, particularly the front row of the refurbished Choir Stalls. Further detailed dimension drawings required.
- NSW H101.12.5 - The new and removable chairs are expected to comply with this provision, further assessment required.
- NSW H101.12.6 – When considering the provisions of this Clause, the altered egress design does not change the existing situation.
- NSW H101.12.7 – When considering the provisions of this Clause, the altered egress design does not change the existing situation.
- H101.12.8 Minimum Clear Space - At the entrance from a row to a clear area, there must be a clear level floor space having a width of at least 350 mm. Architect to confirm compliance.

- H101.13.3 Steps Between Platforms – Requires guardrails/handrails where there is more than 1 intervening step between levels. The guardrail must be provide at a height of not less than 660 mm above the nosing line of the steps, and where a wall is provided, attached to that wall at a height of not less than 865 mm above the nosing line.

  Further developed detail in the area of the temporary step up to the wheelchair platform is required. There are a number of other areas where handrails are yet to be illustrated to new steps within the theatre, a separate highlighted handrail/guardrail plan should be provided for further review and comment.

  Upper Circle Refurbished Steps - Further detail required for comment:
  - Step/going & riser dimensions.
  - Guardrail/handrail details- to the sides of the refurbished steps, as there is more than one step between platforms. (NSW-H101.13.3)
    Aisle guardrails where there is not more than one intervening step; does not appear to be required. (NSW-H101.13.3)
- NSW H101.14.3 – Further assessment of the detailed design required. Only applicable if the new cross over contains a stepped platform, so this is unlikely. The cross-over guard rail are to be no less than 750 mm above finished floor level.
- NSW H101.15 Dressing Rooms – Any such new/altered rooms with a floor area of more than 50 m^2 are required:
  - To be fire separated from the remainder of the building. A review of the pending proposed FRL/compartmentation plans for the proposed design is required.
  - Have at least 2 means of egress. There are more than 2 means of egress from the general dressing room area.
- NSW H101.16 Storerooms – Storerooms are required to be fire separated from other parts of the building by not less than 60/60/60. A review of the pending FRL/compartmentation proposed plans for the proposed design is required. It is noted that there is are a number of proposed changes to store room configurations, which will need to be illustrated as fire rated, i.e. new Store GM.05, GM.03, L1.ST.01 (including existing walls), large Store to BOH L2, Store L1.04, etc. The Rack Room L1.28 may also need to be fire rated if it contains a battery or batteries that have a voltage exceeding 24 volts and a capacity exceeding 10 ampere hours. Electrical Engineer to confirm. *Ref: BCA Clause C2.12*
- NSW H101.18 or 18.1 – Further review of the FRL plans is required in relation any required separation form and fire ratings to the Basement Levels.
- NSW H101.19 – Any alterations to the main switchboard will need to consider the implications of this provision. Please advise is any such alterations or new switchboards are proposed.
- NSW H101.20 - Any alterations to the lighting will need to consider the implications of this provision. Inclusive of aisle lighting to H101.20.3 & 4.
- NSW H101.22 – Nominates additional provisions for smoke and heat vents for stages. It has been confirmed that the Concert Hall does not have an adequate smoke exhaust system at less than 7m3/s. The proposed design has been addressed by the Fire Safety Engineer.

With regards to the complete replacement works in relation to the Stall, Box and Choir seating, further review of the proposed floor and detailed seating layout design is required against the above provisions. As these are considered new works compliance with BCA 2016 will be required.

A number of the NSW H101 Clauses have not considered to warrant assessment under this project because the nature of the proposed works is not significant to the extent that these existing condition should be upgraded at this stage. These have been left off the above list accordingly.

5.0 Essential Fire & Other Measures

This section is to be completed post a review of the updated AFSS and Fire Engineered Report.

Below is a list of essential fire safety services that are required/expected to be installed / designed for the building, and the relevant standards of performance for each measure to be designed/constructed to.

Fire Safety Measure	Standard	BCA Clause(s)	Existing Fire Safety Measures	Proposed Fire Safety Measures
Access panels, doors & hoppers to fire resisting shafts	AS 1530.4 – 2005	C3.13	☐	☐
Atrium provisions • Detection & alarm system • SSISEP • Sprinklers • Smoke exhaust • Stair pressurisation	-	G3.8, Spec G3.8	☐	☐
Automatic fail safe devices	-	C3.8, D2.21, Spec C3.4	☐	☐
Automatic fire detection & alarm systems	AS 1670.1 – 2004 AS 1668.1 – 1998	Spec E2.2a	☐	☐
Automatic fire suppression systems	AS 2118.1 – 1999	Spec E1.5	☐	☐
Building occupant warning system	AS 1670.1 – 2004 AS 2118.1 – 1999	E2.2, E1.5	☐	☐
Emergency lifts	-	E3.1, E3.4, E3.5, E3.10 and Spec E3.1	☐	☐
Emergency lighting	AS 2293.1 – 2005	E4.2, E4.4	☐	☐
Exit signs	AS 2293.1 – 2005	E4.5, NSW E4.6 & E4.8	☐	☐

Fire Safety Measure	Standard	BCA Clause(s)	Existing Fire Safety Measures	Proposed Fire Safety Measures
Fire alarm monitoring system	AS 1670.3 – 2004 AS 4428.6 – 1997	Spec E2.2, Spec E1.5	☐	☐
Fire control centres and rooms	-	E1.8, Spec E1.8	☐	☐
Fire dampers	AS 1668.1 – 1998	Spec E2.2a	☐	☐
Fire doors	AS 1905.1 – 2005	Spec C3.4(fire doors), C3.10 (lift doors)	☐	☐
Fire hose reel systems	AS 2441 – 2005	E1.4	☐	☐
Fire hydrant systems	AS 2419.1 – 2005	E1.3	☐	☐
Fire seals (protecting openings in fire resisting components of the building)	AS 4072.1 – 2005 AS 1530.4 – 2005 AS 1038.15 – 1995	C3.12, C3.13, C3.15	☐	☐
Fire shutters	AS 1905.2 – 2005	Spec C3.4	☐	☐
Fire windows	-	Spec C3.4	☐	☐
Lightweight construction	-	C1.8, Spec C1.8	☐	☐
Mechanical air handling systems *(Strike out which are N/A)* • Auto shutdown • Zone smoke control • Stair pressurisation	AS/NZS 1668.1 – 1998 AS 1668.2 –2012	E2.2, Spec E2.2a, Spec E2.2b	☐	☐
Perimeter vehicle access for emergency vehicles	-	C2.4	☐	☐
Portable fire extinguishers & fire blankets	AS 2444 – 2001	E1.6	☐	☐
Safety curtains in proscenium openings	-	NSW H 101.10 NSW H 101.10.1	☐	☐
Smoke and heat vents	AS 2665 – 2001	Spec E2.2c, Spec G3.8 & NSW H101.22	☐	☐
Smoke dampers	AS 1668.1 – 1998	C3.15, E2.2, Spec C2.5, Spec G3.8	☐	☐
Smoke detectors & heat detectors (Residential)	AS 1670 – 2004 AS 3786 – 1993	Spec E2.2a Spec E2.2a	☐	☐
Smoke doors	-	Spec C3.4, C2.5, D2.6	☐	☐
Solid core doors	-	C3.11, NSWC3.11(d)(ii)	☐	☐
Sound systems and intercom systems for emergency procedures	AS 1670.4 – 2004 AS 4428.4 – 2004	E4.9, Spec G3.8	☐	☐
Standby power systems	-	Spec G3.8	☐	☐
Wall wetting sprinklers & drencher systems	AS 2118.1 – 1999	C3.2, C3.4, C3.8, C3.11, D1.7, D1.8, Spec G3.8	☐	☐
Warning and operational signs	-	C3.6, E3.3, D2.23 & Spec E1.8	☐	☐

Fire Safety Measure	Standard	BCA Clause(s)	Existing Fire Safety Measures	Proposed Fire Safety Measures
Other Measures:				
Paths of Travel	-	D1.6	☐	☐
Alternative Solution, Report No. _____, issued by _____, dated _____ (List main items) • • •	-	*(List Performance Clauses)*	☐	☐

Appendix A
Fire Ratings Required

Table 3 – Type A Construction: FRL of Building Elements

Building Element	Class of Building – FRL (in minutes) Structural Adequacy/Integrity/Insulation			
	Class 2, 3 or 4 part	**Class 5, 9 or 7 (car park)**	**Class 6**	**Class 7 (other than carpark) or 8**
External Wall (including any column and other building element incorporated therein) or other external building element, where the distance from and fire-source feature to which it is exposed is:				
For Loadbearing Parts:				
Less than 1.5m	90/90/60	120/120/120	180/180/180	240/240/240
1.5m to less than 3m	90/60/60	120/90/90	180/180/120	240/240/180
3m or more	90/60/30	120/60/30	180/120/90	240/180/90
For Non-Loadbearing Parts:				
less than 1.5m	- /90/90	- /120/120	-/180/180	-/240/240
1.5m to less than 3m	- /60/60	- /90/90	-/180/120	-/240/180
3m or more	- / - / -	- / - / -	-/-/-	-/-/-
External Column not incorporated in an external wall, where the distance from any fire source feature to which it is exposed is:				
Loadbearing columns	90/-/-	120/-/-	180/-/-	240/-/-
Non-loadbearing columns	- / - / -	- / - / -	-/-/-	-/-/-
Common Walls and Fire Walls:				
	90/90/90	120/120/120	180/180/180	240/240/240
Internal Walls – Fire Resisting lift and stair shafts:				
Loadbearing	90/90/90	120/120/120	180/120/120	240/120/120
Non-Loadbearing	- /90/90	- /120/120	-/120/120	-/120/120
Bounding ***Public Corridors*** public lobbies and the like:				
Loadbearing	90/90/90	120/ - / -	180/ - / -	240/-/-
Non-Loadbearing	- /60/60	- / - / -	- / - / -	- / - / -
Between or Bounding ***Sole Occupancy Units***:				
Loadbearing	90/90/90	120/ - / -	180/ - / -	240/-/-
Non-Loadbearing	- /60/60	- / - / -	- / - / -	- / - / -
`Ventilating, pipe, garbage and like ***shafts*** not used for the discharge of hot products of combustion:				
Loadbearing	90/90/90	120/90/90	180/120/120	240/120/120

Building Element	Class of Building – FRL (in minutes) Structural Adequacy/Integrity/Insulation			
	Class 2, 3 or 4 part	Class 5, 9 or 7 (car park)	Class 6	Class 7 (other than carpark) or 8
Non-Loadbearing	- /90/90	- /90/90	- /120/120	- /120/120
Other Loadbearing Internal Walls, Internal Beams, Trusses and Columns:				
	90/ - / -	120/ - / -	180/-/-	240/-/-
Floors:	90/90/90	120/120/120	180/180/180	240/240/240
Roofs:	90/60/30	120/60/30	180/60/30	240/90/60

See concessions in Spec C1.1 for concessions to these above tabulated requirements, as this may reduce or remove fire rating requirements subject to certain criteria, and haven't been captured in this report.